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09/775,069

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Gerard A. Mourou

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04/29/2011

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EXAMINER

EVANS, GEOFFREY S

ART UNIT

PAPER NUMBER

3742

NOTIFICATION DATE

DELIVERY MODE

04/29/2011

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| | | | |
|------------------------------|--------------------------------------|--------------------------------------|--|
| Office Action Summary | Application No. 09/775,069 | Applicant(s) MOUROU ET AL. | |
| | Examiner Geoffrey S. Evans | Art Unit 3742 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 October 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 46-67 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 46-67 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The disclosure is objected to because of the following informalities: The first paragraph of the specification should be amended to more accurately refer to related applications.

Appropriate correction is required.

The following language is respectfully suggested:

“More than one reissue application has been filed for the reissue of Patent No. 5,656,186. The reissue applications are application numbers 09/775,069 (the present application), 09/775,106, and 09/366,685, which has issued as RE37,585, all of which are divisional reissues of Patent No. 5,656,186.”

2. The drawings are objected to because the drawings filed on 2/1/2001 are not copies “of each drawing sheet of the printed patent”. Therefore the drawings are objected to as failing to comply with 37 CFR 1.173(a)(2). See also MPEP 1410, first paragraph. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering

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of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. This application does not contain an abstract of the disclosure as required by 37 CFR 1.72(b). An abstract on a separate sheet is required.

4. Regarding paragraphs 2 and 3 above, please submit a copy of the first two pages of the patent which includes the abstract in addition to copies of the drawings from the patent.

5. Since a Reexam Certificate has been issued, Applicant must submit an amendment based on the results of the reexam proceeding. (See MPEP 1449.01(B)(1)). Respectfully suggest an amendment that states:: "Please delete all claims in the prosecution and enter the following set of claims:" Present claims 1-64 as they now exist in the reexamined patent (except that claim 6, which was cancelled in the reissue, should be presented in strike-through). This is because they relate back by virtue of the reexam certificate. They should be presented without any underlining and bracketing in their text (as if it were done via a certificate of correction). The claims 1-64 should be shown in brackets, except claim 6, which is presented in strike-through, due to their cancellation. The current claims 46-67 should be presented as claims 65-86. In the remarks, applicant should state: "Please add claims 1-64, as cancelled (as reflected by their enclosure in brackets) and please enter claims 65-86.

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6. Claims 46-67 are rejected under 35 U.S.C. 251 as being broadened in a reissue application. Regarding claim 46, it recites a biologic material characterized by a log-log relationship between fluence threshold at which breakdown occurs. None of the claims in RE 37585 F1 directed to laser induced breakdown of a biologic material recite this relationship. Claim 7 of RE 37585F1 discloses determining where the ablation (LIB) fluence threshold is no longer proportional to the square root. Similarly independent claims 53 and 59 of RE 37585F1 recite a relationship of fluence threshold at which breakdown occurs versus the square root of laser pulse width. Therefore all of the independent claims in this application directed to laser ablation of the biologic material should recite this relationship or be no broader than independent claims 51 (that recites first and second curves and selecting the fluence level according to two conditions as recited in claim 51) or claim 55. A "log-log" relationship as recited in various independent claims is not the same function as a square root and is considered to be a broadening of the claims from the allowed claims in RE 37585 F1. Please note that a reexamination certificate US RE37,585 F1 was issued on March 6,2007. Please note that under MPEP Section 1449.01(B)(3) states that generally, further prosecution will be limited to claims narrower than those claims canceled by the reexamination certificate. Any claims added thereafter, which are equal in scope to claims canceled by the reexamination certificate, or are broader than the scope of the claims canceled by the reexamination certificate, will generally be deemed as surrendered based on the patent owner's failure to prosecute claims of equal scope, and to present claims of broader scope in the reexamination proceeding. The two exceptions to this rule (a) The broader

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claims in the reissue application can be patentable, despite the fact that the claims in the reexamination are not; and (b) The broader claims in the reissue application could not have been presented in the reexamination proceeding are not applicable.

7. Claims 46-67 are rejected under estoppel for the same reasons in the preceding paragraph based on MPEP Section 2308.03 since a reexamination is a proceeding. See MPEP Section 1449.01(B)(3).

8. Claims 46-53,60,61,62/46,62/52,62/60,62/61, 63/46,63/52,63/60,63/61, 64/46,64/52,64/61,65/46,65/52,65/61, 66/46,66/52,66/60,66/61,67/46,67/52,67/60 and 67/61 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. There is no specific disclosure in original US Patent No., 5,656,186 or Ex parte Reexamination Certificate US RE37,585 F1 of a "log-log" relationship between the fluence threshold at which breakdown occurs versus laser pulse width as recited in current independent claims 46,52,60 and 61.

9. Claim 63 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Acronyms should not be present in the claims as they can be misinterpreted. Respectfully suggest replacing "LIB" with laser induced breakdown to obviate this rejection.

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10. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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11. Claims 46,47,50,51,54,55,58,59,60,61, 63/46,63/54,63/55, 63/60,63/61,64/46,64/55,65/46,65/55,65/61,66/46,66/54,66/55,66/60,66/61,67/46, 67/54, 67/55,67/60,67/61 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 46 of copending Application No. 09/775,106 in view of Stern et al. in the article "Corneal Ablation by Nanosecond, Picosecond, and Femtosecond Lasers at 532 and 625 nm" by Stern et al.. Claim 46 of 09/775,069 discloses ablating a transparent material by laser induced breakdown with a pulsed laser beam. Stern et al. teaches laser ablation of a cornea at 532 nm and 625 nm (see figure 2) and further that the cornea is transparent at wavelengths that are visible and near-infrared (see page 587, column 2,lines 6-9), and a change in slope to a slowly varying threshold value at a predetermined pulse width (see figures 1 and 2). Stern further teaches as shown in figure 2 using a 1 picosecond (i.e. 1000 femtoseconds) laser beam with a fluence threshold of about 10 microjoules and further on page 588,column 1,lines 15-19 using a pulse energy approximately ten times the threshold , and spot diameter of approximately 25 microns (see page 587, column 3,lines 36-38). This results in a fluence level of approximately 20.4 Joules/cm^2 . Stern et al. also teaches a log-log relationship between laser ablation depth and pulse width (see page 588, column 3,lines 26-33). Stern et al. further teaches optical breakdown without adversely effecting peripheral areas adjacent to the spot, and a repetition rate of 8,000 pulses per second (see figure 2). It would have been obvious to adapt claim 46 of copending application No. 09/775,069 in view of Stern et al. to provide this to accurately laser cut a cornea.

This is a provisional obviousness-type double patenting rejection.

12. Claims 48 and 49 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 46 of copending Application No. 09/775,069 in view of Stern et al. as applied to claim 46 and further in view of Lai in U.S. Patent No. 5,984,916 and Nishiwaki et al. in Japan Patent No. 62-93,095. Lai teaches in column 16, lines 35-37 using a beam spot diameter of about 10 microns and notes the desirability of using different beam spot diameters for different operations (see column 12, lines 57-59). Nishiwaki et al. teach changing lenses having different focus lengths (and therefore different f numbers) to adjust the beam spot size. It would have been obvious to adapt Stern et al. in view of claim 46 of copending Application No. 09/775,069 in view of Stern et al., Lai and Nishiwaki et al. to provide this to adjust the beam spot size.

This is a provisional obviousness-type double patenting rejection.

13. Claims 52, 63/52,64/52,65/52,66/52,67/52 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 46 of copending Application No. 09/775,069 in view of Stern et al. in the article "Corneal Ablation by Nanosecond, Picosecond, and Femtosecond lasers at 532 and 625 nm" and Nishiwaki et al. in Japan Patent No. 62-93,095. Claim 46 of U.S. Patent Application No. 09/775,106 discloses laser ablating a transparent material by laser induced breakdown with a pulsed laser beam. Stern et al. teach laser ablation of a cornea at wavelengths of 532 nm and 625 nm and that a cornea is transparent at wavelengths that are visible and near-infrared (see page 587, column 2, lines 6-9) and a

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log-log relationship between the ablation threshold and pulse width (see page 588, column 3, lines 26-33), generating a laser pulse of approximately 1 picosecond (see figure 2), with an ablation threshold of approximately 10 microjoules (also in figure 2). Stern et al. further teach on page 588, column 1, lines 15-19 using a pulse energy as high as ten times the ablation threshold; which for a pulse duration of 1 picosecond must be approximately 100 microjoules. Stern et al. further teach a spot diameter of about 25 microns (see page 587, column 3, lines 36-38). For such parameters the fluence level for a pulse with an energy of 100 microjoules and a spot diameter of about 25 micrometers is approximately 20 joules/cm². Nishiwaki et al. teach using a laser beam with a lateral gaussian profile to cut in the beam spot where the beam intensity is a larger than a threshold value for cutting the material.

This is a provisional obviousness-type double patenting rejection.

14. Claim 53 is provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 46 of copending Application No. 09/775,106 in view of Stern et al. and Nishiwaki et al. as applied to claim 52 and further in view of Lai in U.S. Patent No. 5,984,916, Arai in Japan Patent No. 5-42,382 and Spratte et al. in U.S. Patent No. 5,175,425. Lai teaches in column 4, lines 58-61 using a laser beam with a wavelength from 400 nm to 1900 nm to cut a tissue (a cornea). Arai teaches using a crystalline body to create a harmonic from a fundamental wavelength (in this case 1064 nm) (see figure 1). Spratte et al. teach that a frequency doubler effects a sharper focusing of the laser spot (see column 5, lines 12-17). It would have been obvious to adapt claim 46 of U.S. Patent Application No. 09/775,106 in view of

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Stern et al., Nishiwaki et al., Lai and Arai and Spratte et al. to provide this since the shorter wavelength allows tighter focusing due to the reduction in the diffraction limited spot size.

This is a provisional obviousness-type double patenting rejection.

15. Claims 56 and 57 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 46 of copending Application No. 09/775,106 in view of Stern et al. and further in view of Lai in U.S. Patent No. 5,984,916. Lai teaches as shown in figure 9A that the laser beam may be positioned beneath the surface of the material and scanning the laser beam along a path (see figure 8B) by using a scanner (see column 8, lines 56-59). It would have been obvious to adapt claim 46 of copending application No. 09/775,106 in view of Stern et al. and Lai to provide this to laser cut the interior of a cornea.

This is a provisional obviousness-type double patenting rejection.

16. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

17. Claims 46, 47, 50, 51, 54, 55, 58, 59, 60, 61, 63/46, 63/54, 63/55, 63/60, 63/61, 64/46, 64/55, 64/61, 65/46, 65/55, 65/61, 66/46, 66/54, 66/55, 66/60, 66/61, 67/46, 67/54, 67/55, 67/60 and 67/61 are rejected under 35 U.S.C. 102(b) as being

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anticipated by the article "Corneal Ablation by Nanosecond, Picosecond, and Femtosecond Lasers at 532 and 625 nm" by Stern et al.. Stern et al. disclose laser induced breakdown (LIB, see page 591, column 1, line 25) of a biologic material (a cornea) with a log-log relationship between fluence threshold at which breakdown occurs versus laser pulse width (see page 588, column 3, line 29), generating a laser pulse of approximately 1 picosecond (see figure 2) with an ablation threshold of 10 microjoules. Stern further discloses on page 588, column 1, lines 15-19 using pulse energy as high as ten times the ablation threshold which for a pulse duration of 1 picosecond is 100 microjoules. The fluence level is determined by the joules/ per unit area. Stern discloses on page 587, column 3, and lines 36-38 that the spot diameter is about 25 micrometers. The area of a circle is approximately $3.14r^2$, where 3.14 is an approximation of the Greek letter pi and r is the radius of a circle. (The Greek letter pi equals the circumference of a circle divided by the diameter of a circle). Since the diameter is about 25 microns the radius is 12.5 microns. Therefore the fluence level is $100 \times 10^{-6} \text{ Joules} / (12.5 \times 10^{-6} \text{ meters})^2 (3.14) = 1 \times 10^{-4} \text{ Joules} / 3.14 (0.00125) (0.00125) \text{ cm}^2 =$ approximately 20.4 J/cm^2 , which is greater than 5 J/cm^2 . Regarding claim 50, Stern in page 587, column 2, and lines 6-8 discloses that visible and near -infrared lasers can also be used for corneal ablation, even though at these wavelengths the cornea is transparent. Since Stern discloses using a laser beam with a wavelength of 625 nm (see page 587, column 3, line 7) at that wavelength the cornea must be transparent. Since Stern discloses the laser pulse reaching the cornea, Stern is considered to disclose providing a path by which the pulse is directed toward the surface of the

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material. Regarding claim 51, Stern discloses using a laser beam with a pulse width of 1 picosecond (i.e. 1000 femtoseconds) and that the pulse has an energy of 10 microjoules (which is within the range recited in claim 51. The disclosure in a piece of prior art of any value within a claimed range is anticipation of the claimed range. (see In re Wertheim, 191 USPQ 30, 1000 (CCPA 1976)). Regarding claim 54, Stern discloses a fluence level greater than 5 J/cm^2 , a pulse width of 1 picosecond and a pulse energy of 100 microjoules and that laser ablation at 1 picosecond is more efficient than at longer pulses (see last line of page 588 and top few lines of column 1, page 589) that disclose a change in slope at low energy levels. Regarding claim 55, Stern discloses a method for laser induced breakdown (LIB) of a biologic material with a pulsed laser beam and a change in slope at a characteristic pulse width, a fluence greater than 5 J/cm^2 and inducing plasma in the material (see page 591, column 3, lines 11-20). Stern further discloses a log-log relationship of the pulse width to the ablation (see page 588, column 3, lines 26-33). Regarding claim 58, since plasma is present, the breakdown is considered to include changes caused by one or more of ionization, free electron multiplication, dielectric breakdown, plasma formation and vaporization. Regarding claim 59, Stern et al. disclose plasma formation (see page 591, column 3, lines 11-34.) Regarding claim 60, Stern et al. disclose a method for laser induced breakdown (LIB) of a biologic material with a pulsed laser beam, the material being characterized by a log-log relationship between fluence threshold at which breakdown occurs versus laser pulse width (see page 588, column 3, lines 26-33) generating at least one laser pulse which has a width of about 1 picoseconds (i.e. 1000 femtoseconds), the pulse having an

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energy of about 100 microjoules (figure 2 on page 588 discloses laser ablation threshold for a pulse with a pulse width of about 1 picosecond at about 10 microjoules and on page 588, column 1, lines 15-19 discloses for each pulse duration using a pulse energy at ten times the ablation threshold, i.e. about 100 microjoules). Since Stern et al. disclose a beam spot diameter of 25 microns, this means that the pulse has a laser fluence of about 20.4 J/cm^2 . Since Stern et al. discloses laser ablation of a cornea, inherently Stern provides a path by which the laser is directed toward the surface of the material. Regarding claim 61, Stern et al. discloses laser induced breakdown (LIB) of a biologic material with a pulsed laser beam, the method comprising the steps of: generating a pulsed laser beam at 1 picosecond (see figure 2) which is considered to be a pulse width equal to or less than a characteristic pulse width, the characteristic pulse width, the characteristic pulse width defined by a region of log-log relationship between fluence breakdown and pulse width (see page 588, column 3, lines 26-33) (please also note that the instant specification admits that the scaling law of the ablation threshold is true to about 10 ps and fails when the pulse duration is shortened to less than a few picoseconds in column 8, lines 23-26). Regarding the rejection of claims 63/46, 63/54, 63/55, 63/60, 63/61, Stern et al. disclose with femtosecond and picosecond laser pulses tissue damage from the excision edges is almost non-existent. (See columns 2 and 3 of page number 589). Regarding the rejection of claims 64/46, 64/55, and 64/61, Stern et al. discloses a pulse width of 65 femtoseconds and a pulse width of 1 picosecond, which is equal to 1000 femtoseconds. Regarding the rejection of claims 65/46, 65/55, and 65/61, Stern et al. discloses one or more laser pulses with a pulse

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energy of 100 microjoules. Regarding the rejection of claims 66/46, 66/54, 66/55, 66/60, and 66/61, Stern et al. disclose in figure 2 on page 588 a repetition rate of 8 KHz, i.e. 8,000 pulse per second. Regarding the rejection of claims 67/46, 67/54, 67/55, 67/60 and 67/61, Stern et al. disclose in figure 2 using wavelengths of 532 nm and 625 nm.

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

19. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

20. Claims 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stern et al. in the article "Corneal ablation by Nanosecond, Picosecond and Femtosecond lasers at 532 and 625 nm" in view of Lai in U.S. Patent No. 5,984,916 and Nishiwaki et al. in Japan Patent No. 62-93,095. Lai teaches in column 16, lines 35-37 using a beam spot diameter of about 10 microns and notes the desirability of using

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different beam spot diameters for different operations (see column 12, lines 57-59).

Nishiwaki et al. teaches changing lenses having different focus lengths (and therefore different f numbers) to adjust the beam spot size. It would have been obvious to adapt Stern et al. in view of Lai and Nishiwaki et al. to provide this to adjust the beam spot size.

21. Claims 52,63/52,64/52,65/52,66/52,67/52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stern et al. in the article "Corneal Ablation by Nanosecond , Picosecond, and Femtosecond lasers at 532 and 625 nm" in view of Nishiwaki et al. in Japan Patent No. 62-93,095. Stern et al. disclose laser induced breakdown (LIB, see page 591, column 1, line 25, of a biologic material (a cornea) with a log-log relationship between fluence threshold at which breakdown occurs versus laser pulse width (see page 588, column 3, line 29), generating a laser pulse of approximately 1 picosecond (in figure 2) with an ablation threshold of approximately 10 microjoules (also in figure 2). Stern further discloses on page 588, column 1, and lines 15-19 using a pulse energy as high as ten times the ablation threshold; which for a pulse duration of 1 picosecond must be approximately 100 microjoules. Stern et al. disclose on page 587, column 3, lines 36-38 that the spot diameter is about 25 micrometers. Since fluence level is joules/cm^2 , the fluence level for a pulse with an energy of 100 microjoules and a spot diameter of 25 micrometers is approximately 20 Joules/cm^2 . Stern et al. does not disclose a lateral gaussian profile characterized in that fluence at or near the center of the beam spot is greater than the threshold fluence whereby the laser induced breakdown is ablation of an area within the spot. Nishiwaki et al. teaches using a laser

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beam with a lateral gaussian profile to cut in the beam spot where the beam intensity is larger than a threshold value for cutting the material. It would have been obvious to adapt Stern et al. in view of Nishiwaki to provide this to finely cut the material.

22. Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stern et al. in view of Nishiwaki et al. as applied to claim 52 above, and further in view of Lai in U.S. Patent No. 5,984,9616, Arai in Japan Patent No. 5-42,382 and Spratte et al. in U.S. Patent No. 5,175,425. Lai teaches in column 4, lines 58-61 using a laser beam with a wavelength from 400 nm to 1900 nm to cut tissue (a cornea). Arai teaches using a crystalline body to create a harmonic from a fundamental wavelength (in this case 1064 nm) (see figure 1). Spratte et al. teach that a frequency doubler effects a sharper focusing of the laser spot (see column 5, lines 12-17). It would have been obvious to adapt Stern et al. in view of Nishiwaki et al., Lai, Arai and Spratte et al. to provide this since the shorter wavelength allows tighter focusing due to the reduction in the diffraction limited spot size.

23. Please note that while Bovatsek et al. (U.S. Patent Application Publication No. 2006/0207976 (see paragraph 37) is not prior art and not applied in the 103 rejection of claim 53, is evidence that inherently a shorter wavelength allows for tighter focusing due to the reduction in the diffraction limited size.

24. Claims 56 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stern et al. in view of Lai in U.S. Patent No. 5,984,916. Lai teaches laser cutting a cornea along a scanned path (e.g. see figure 8B) by using a scanner (see column 8, lines 56-59) and means for verifying the scan position of the laser beam (see column

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9, lines 23-25). Official notice is taken that determining the initial position of a laser beam prior to performing laser cutting is old and well known in the art. Lai further discloses as shown in figure 9A that the laser beam may be positioned beneath the surface of the material. It would have been obvious to adapt Stern in view of Lai to provide this to accurately cut a desired area or line or segment of the cornea.

Regarding claim 57, Lai teaches laser cutting a cornea along a scanned path (e.g., see figure 8B) by using a scanner (see column 8, lines 56-59) and means for verifying the scan position of the laser beam (see column 9, lines 23-25). Official notice is taken that determining the initial position of a laser beam prior to performing laser cutting is old and well known in the art. Lai further discloses as shown in figure 9A that the laser beam may be positioned beneath the surface of the surface of the material. Official notice is taken that the Rayleigh length is the distance between the beam waist (focus) and the point where the beam size is the square root of 2 times the waist size, i.e. the near field region. It would have been obvious to one of ordinary skill in the art to adapt Stern et al. in view of Lai to provide scanning the beam to a depth smaller than the Rayleigh range so that the cut from the depth smaller than the workpiece reaches the surface of the workpiece.

25. Please note that Stern et al. disclose as shown in figure 2 a picosecond laser beam with a threshold of 10 microjoules that corresponds to approximately 2.04 J/cm^2 as a lower limit. Since Stern et al. discloses ablation performed at 3 to 6 values between the lower limit threshold and 10 times the lower threshold value (see page 588,

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column 1, lines 15-19) all fluence values between 2.04 Joules/cm² and 20.4 Joules/cm² are considered to be obvious over Stern et al. for the 1 picosecond pulse.

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Funami et al. in U.S. Patent No. 5,055,653 discloses the pulse threshold of a laser beam (see figure 4a)..

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey S. Evans whose telephone number is (571)-272-1174. The examiner can normally be reached on Mon-Fri 7:00AM to 3:30 PM (flexible).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tu Hoang can be reached on (571)-272-4780. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Geoffrey S Evans/ Primary Examiner, Art Unit 3742